Thursday Morning, October 21, 2010

Biomaterial Interfaces
Room: Taos A - Session BI2+NS-ThM

Quantitative Sensing at Biointerfaces
Moderator: E.O. Reimhult, University of Natural Resources and Applied Life Sciences, Switzerland

10:40am **BI2+NS-ThM9 Membranes on Solid Surfaces**, ***A.P. Shreve***, Los Alamos National Laboratory **INVITED**

Lipid assemblies on solid substrates provide a means of integrating biological and non-biological systems. They serve as a basis for a number of technological applications, particularly biological sensing and imaging platforms. They also provide important materials for the study of fundamental biophysical processes, and additionally are a platform for the study of the structure and dynamics of low-dimensional complex fluids. Working with a number of collaborators [1-4], we have been investigating how lipids interact with variously textured and functionalized solid surfaces, with an emphasis on the use of optical microscopy and spectroscopy as means of interrogating structure, dynamics and function within membrane assemblies on surfaces. Selected examples from recent and ongoing work will be discussed, including the use of diffusion measurements to infer the nature of membrane interactions with nanotextured surfaces, preparation and characterization of controlled multi-bilayer architectures, study of how electrostatic interactions with surfaces affect the structure and asymmetry of membranes, the interaction of functionalized nanoparticles and nanomaterials with membranes, and the development and characterization of multicomponent membranes on patterned nanoporous and nanostructured substrates. All of these topics are related to long-term interests in the application of solid-substrate supported lipid assemblies in sensing and characterization of biological systems.

[1] T.H. Yang, C.K. Yee, M.L. Amweg, S. Singh, E.L. Kendall, A.M. Dattelbaum, A.P. Shreve, C.J. Brinker, A.N. Parikh, "Optical detection of ion-channel-induced proton transport in supported phospholipid bilayers," *Nano Letters* **7** (2007) 2446. [2] A.E. Oliver, E.L. Kendall, M.C. Howland, B. Sanii, A.P. Shreve, A.N. Parikh, "Protecting, patterning, and scaffolding supported lipid membranes using carbohydrate glasses," *Lab on a Chip* **8** (2008) 892. [3] A.P. Shreve, M.C. Howland, A.R. Sapuri-Butti, T.W. Allen, A.N. Parikh, "Evidence for leaflet-dependent redistribution of charged molecules in fluid supported phospholipid bilayers," *Langmuir* **24** (2008) 13250. [4] J.H. Werner, G.A. Montaño, A.L. Garcia, N.A. Zurek, E.A. Akhadov, G.P. Lopez, A.P. Shreve, "Formation and dynamics of supported phospholipid membranes on a periodic nanotextured substrate," *Langmuir* **25** (2009) 2986.

11:20am **BI2+NS-ThM11 2010 AVS Albert Nerken Award Lecture - AlGaN/GaN High Electron Mobility Transistor Based Sensors for Bio-Applications**, ***F. Ren****, *S.J. Pearton*, *B.H. Chu*, *C.Y. Chang*, University of Florida, *W.J. Johnson*, Nitronex, *A. Dabiran*, *P.P. Chow*, SVT Associates **INVITED**

It is highly desirable to have a programmable, single chip sensor with an array of sensors for different purposes that is handheld and capable of wireless communication. This kind of sensor can be very useful for environmental, safety, and biomedical applications. For example, the sensor can be programmed in the doctor office for specific uses to give it to patients to use at home, transmitting the sensing results to their doctor directly to monitor the effectiveness of prescribed medicines. Thus, patients can get better, prompt and adequate health care. It can also reduce the number of unnecessary visits to the emergency room and the cost of the national health system. AlGaN/GaN high electron mobility transistor based sensors are good candidates for low cost, handheld, and wireless chemical and biomedical sensor due to their excellent thermal as well as chemical stability and sensitivity to the changes of ambient. We have demonstrated AlGaN/GaN HEMT based individual sensors for protein, DNA, kidney injury molecules, prostate cancer, pH values of the solutions, pH in the exhaled breath condensate, and mercury ions with specific surface functionalizations. Recently, we integrated ZnO nanorods with AlGaN/GaN HEMT to detect glucose. This approach offers a possibility of integrating AlGaN/GaN HEMT based sensors with ZnO nanorod sensors on a single “smart sensor chip” for bio-sensing applications.

***** Albert Nerken Award Winner

Authors Index

Bold page numbers indicate the presenter